

The Fossil Mymaridae

(Hymenoptera: Chalcidoidea)

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The Mymaridae are very minute wasps which develop solely as primary parasitoids within the eggs of other insects. The fossilized specimens found in amber are very similar morphologically to species living today, and it is probable that the fundamental habits of the mymarids as parasitoids have remained unchanged for at least 30,000,000 years. These small insects are frequently found entangled in sticky material placed on boards suspended in trees, so it is understandable how their general search for hosts in arboreal habitats could easily have led to occasional entrapment in gums or resins, and thus eventually to fossilization in amber.

The Mymaridae were first recognized as fossils in amber by Loew in 1847. They have been found in Canadian (Cretaceous), Baltic (early Oligocene), Mexican (late Oligocene and early Miocene), and Sicilian (Miocene) ambers. Species have also been described from the recent copal of Madagascar and Zanzibar. This paper includes comments on all of the known fossil members of this interesting family of chalcids, but it is primarily concerned with a series of Mymaridae found in late Oligocene or early Miocene amber from the Simojovel area, Chiapas, Mexico. According to Langenheim (1969) the leguminous genus *Hymenaea* is the probable source of the Chiapas amber. The modern species, *H. courbaril*, is known for its abundant secretion of resin that accumulates in the soil around the tree. Langenheim states that in Mexico today, *H. courbaril* grows commonly along rivers that enter the ocean in mangrove-fringed estuaries. It is believed that the Chiapas amber was deposited in such an estuarine environment.

According to the classification proposed by Annecke and Doutt (1961), the family Mymaridae consists of two subfamilies and five tribes. Both subfamilies are well represented in the fossil record (Appendix). However, most of the fossil species in each subfamily are in a single tribe. In each case, Alaptini and Ooctonini, all members of the tribe are characterized by possessing five tarsomeres. This is a more primitive condition than the four tarsomere formula exhibited by members of the other tribes in each subfamily. Of the 16 species

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recognized in the fossil record only *Alaptus globosicornis* Girault, *Alaptus psocidivorus* Gahan, and *Palaeomymar duisburgi* (Stein) are known to be extant.

Subfamily ALAPTINAE

Genus ALAPTUS Westwood

The species of *Alaptus* are noteworthy because of their minuteness. Adult specimens of these wasps usually do not exceed 0.3 mm in total length, and are among the smallest of all known insects. The few species of *Alaptus* which have been studied biologically develop within the eggs of Psocoptera.

In 1909 Meunier found and described an *Alaptus* in recent copal from Zanzibar. This first account of a fossilized *Alaptus* is based on a single male specimen for which Meunier proposed the name *Alaptus fructuosus*. It is difficult to compare this species with existing forms because Meunier's description is inadequate in certain critical details, and our present system of classification is based primarily on female rather than on male characters. Therefore the correct placement of any *Alaptus* male at the species level is largely speculative.

The series of Mymaridae in the Simojovel amber contains at least two species of *Alaptus*. There are four female specimens (University of California Museum of Paleontology numbers 12773, B-1402; 12778, B-1402; UCMP 12631, B-4112; and UCMP 12632, B-4117) which are indistinguishable from *Alaptus psocidivorus* Gahan, a species which exists today in California as a parasite of the psocid, *Peripsocus californicus* Banks, on Toyon, *Heteromeles arbutifolia* M. Roem.

One female *Alaptus* (UCMP 12897, B-5106) is morphologically very close to the species *A. globosicornis* Girault. Although the first funicle segment is longer than typical *A. globosicornis*, and the general habitus is less compact, these differences are insufficient to justify naming this single specimen as a representative of a new species. This conservative view is justified because *A. globosicornis* appears to be a highly variable species, and Girault (1912) not only indicated that modifications in the original description of the species were necessary but that at least two "varieties" existed, which he termed *hawaiiensis* and *australiensis*. One specimen in the present series of fossil *Alaptus* (UCMP 12633, B-7043) is difficult to place, but it is probably also *A. globosicornis* or closely related.

There are five male *Alaptus* in the Simojovel amber that seem to represent two species. Two specimens are very dark colored and have

comparatively short antennal segments (UCMP 12898, B-5106 and UCMP 12634, B-7041). The other specimens (UCMP 12625; UCMP 12636, B-4112; and UCMP 12638, B-4112) are light brown in color with more elongate legs and antennae. It is possible that these males relate respectively to *A. globosicornis* and *A. psocidovor*, but there is no way at present to associate them with certainty.

Genus *LITUS* Haliday

Meunier (1901) described *Litus elegans* from a female found in Baltic (early Oligocene) amber, and later (1909) he described *Litus beneficus* from the recent copal of Madagascar. The Simojovel amber contains one female *Litus* which is distinctly different from Meunier's species, and is also unlike any of the species which are known to exist today. It is described as follows:

***Litus mexicanus* Douthett, new species**

FEMALE.—Length 0.54 mm. Antenna as in Fig. 1. Scape long, moderately expanded, funicle segments heavily setaceous, segments 2 to 6 each with single short paddle-shaped structure located dorsally and apically, club large, elongate, with many short setae. Head distorted in this specimen but ommatidia large. Condition of thorax precludes analysis of surface sculpturing. Basitarsal segment of foreleg long, strigil prominent, calcar large, stout, curved and bifid. Middle legs long and slender. All tibiae with strong setae. Forewings broken but general shape and venation normal for genus. Hindwing maculate, with single line of small discal setae. Ovipositor originates at base of abdomen, large, prominent, markedly exserted.

The expanded scape, paddle-shaped sensoria, and the strongly developed and exserted ovipositor distinguish *L. mexicanus* from other species of *Litus*.

The type specimen is in the University of California Museum of Paleontology, Berkeley, with the UCMP number 12812, B.-7041. From Oligocene amber, Chiapas, Mexico.

Species of *Litus* occur today in South America and in the Caribbean area, but this fossil is the first record from Mexico. The true host relationships of *Litus* are not known, although *L. cynipseus* Haliday was found in a colony of the ant, *Lasius niger*, where it may have been parasitizing eggs of coleopterous myrmecophiles.

Genus *MALFATTIA* Meunier

Meunier (1901) described this genus from a single specimen with four segmented tarsi and nine segmented antennae. The genus has

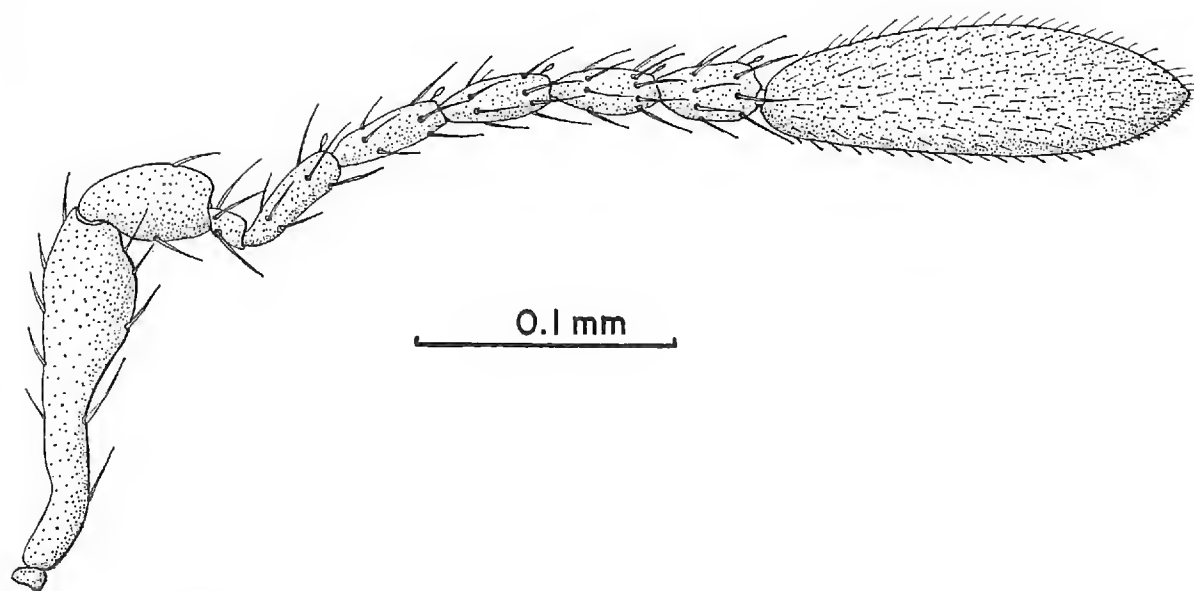


FIG. 1. Female antenna of *Litus mexicanus* Doult.

been synonymized with *Litus* by Ashmead (1904) although he doubted whether this was correct. The four segmented tarsi would make such placement erroneous. Meunier believed that his specimen was related to one from Sicilian amber discussed by Malfatti, and accordingly named it in his honor. *Malfattia* remains as a very poorly known and doubtfully placed genus until Meunier's specimen can be re-examined.

Subfamily MYMARINAE

Genus LYMAENON Walker

The species *Lymaenon henneberti* (Meunier) described from Baltic amber in 1905 is the only known fossil in this genus. There are many modern species in *Lymaenon* (formerly *Gonatocerus*), and they attack a wide variety of hosts in many different habitats.

Genus ARESCON Walker

Meunier (1901, 1905) described two species of fossil Mymaridae in the genus *Leimacis*, but properly they should be placed in the genus *Arescon*. Both species, *Arescon armata* (Meunier) and *A. baltica* (Meunier) are from Baltic amber. Nothing is known of the host relationships of our modern species.

Genus OOCTONUS Haliday

Brues (1937) found a Mymarid in Canadian amber which he described as *Ooctonus* (?) *minutissimus* but gave no indication why he believed the generic placement to be doubtful. This specimen is Cre-

taceous, and is therefore the oldest known fossil member of the family. *Ooetonus* is reared from eggs of leafhoppers and is not considered to be a primitive form.

Genus PALAEOMYMAR Meunier

Palaeomymar Meunier, 1901. Ann. Soc. Sci. Bruxelles. 25(2): 288-289.

Type: *Palaeomymar duisburgi* (Stein) 1877, Mitt. München entomol. Ver. 1: 30. New Combination.

Palaeomymar succini Meunier, 1901, Ann. Soc. Sci. Bruxelles. 25(2): 289.

Petiolaria anomala Blood and Kryger, 1922. Entomol. Mon. Mag. 58: 229.

Mymaromma Girault, 1920. Insec. Inscit. Menstr. 8: 38. New synonym.

Type: *Mymaromma goethei* Girault.

Petiolaria Blood and Kryger, 1922. Entomol. Mon. Mag. 58: 229. New synonym.

Type: *Petiolaria anomala* Blood and Kryger.

Mymaromella Girault, 1931. A new habit in an old insect, *Homo pudicus* and new Eurytomidae. Privately published, Brisbane, Sept. 1, 1931. p. 4 New synonym.

TYPE.—*Mymaromella mira* Girault.

The above synonymy is solely the result of this comparative study of fossil Mymaridae, and it has the virtue of solving the problem of the correct placement of *Palaeomymar* which has been troubling students of Mymaridae for many years. The riddle began in 1868 when Duisburg described and illustrated, but did not name, a female Mymarid in amber which he believed belonged to the genus *Mymar*. Later Stein (1877) in studying another specimen in amber believed that it agreed in all the essentials with Duisburg's insect and accordingly named it *Mymar Duisburgi*.

In 1901 Meunier placed *M. Duisburgi* Stein into the genus *Eustochus*, created the new genus *Palaeomymar* for five specimens of the series discussed by Duisburg in 1868, and stated that representatives of the genus *Mymar* were not known in the fossilized state.

In 1922 Blood and Kryger discovered a modern mymarid of a very unusual type in England and Denmark. They designated it as a new genus and species, namely *Petiolaria anomala* Blood and Kryger. They were not aware that the same genus occurred in Australia and had been described there two years earlier as *Mymaromma* by Girault.

In 1948 Bakkendorf independently found the 1868 paper by Duisburg and correctly concluded that the amber insects seen and described therein were conspecific with *Petiolaria anomala* Blood and Kryger. Bakkendorf did not mention the works of Stein (1877) nor of Meunier (1901), but his recognition of Duisburg's specimen as *P. anomala*

was correct and has furnished the clue to the present placement of *Palaeomymar*. There is now ample evidence that the species pictured by Duisburg (1868), described and named by Stein (1877), discussed by Meunier (1901) under *Eustochus*, and identified by Bakkendorf (1948) as *Petiolaria anomala* Blood and Kryger is actually a single species, based on characters of the female sex. The males of this same species were not recognized as such by Meunier who instead proposed the genus *Palaeomymar* for them.

It is very probable that Meunier's specimens of *Palaeomymar* are identical with the males of *Mymaromma* (*Petiolaria*) *anomala*. One is especially convinced of this when Debauche's (1948) illustrations of the structural characters of *Mymaromma* are compared with the figures of the same structures published by Meunier (1901). The male antennae of *Mymaromma* are distinctive and these same unique features are seen in the antennae figured by Meunier for *Palaeomymar*. Similarly, the female antennae of *Mymaromma anomala* with its characteristic seven segmented funicle is mirrored in the figure given by Meunier for what he termed *Eustochus duisburgi*. Although Meunier's drawing of the forewing of *Palaeomymar* is not the best example of entomological draftsmanship it is nevertheless unmistakably the wing of the insect which has been known as *Mymaromma*.

The foregoing evidence seems sufficient to justify the proposed synonymy. It is of interest that *Palaeomymar* is well represented by a large series of specimens in the Chiapas amber at the University of California Museum of Paleontology. These specimens deserve very careful study.

Genus ANAPHES Haliday

This genus contains two fossil representatives which were described by Meunier (1901) from Baltic amber. These are *Anaphes schellwieniens* and *A. splendens*.

The Mexican amber contains a male which is probably an *Anaphes*. This lone male in the Simojovel material can be placed only tentatively because the classification of the group is based upon female characters. The specimen with the UCMP number 12640, B-7046 is very dark, which is characteristic of many *Anaphes*, and it has the general habitus and wings of that genus.

Genus POLYNEMOIDEA Girault

Until its discovery in the Chiapas amber, no member of this genus had ever been found outside the southern hemisphere, and it is a genus

that is seldom seen by mymarid specialists today. The five extant species are all Australian, and the closely allied genera such as *Idiocentrus* and *Notomymar* are also antipodal. Thus the specimen in the Simojovel series is of considerable interest, and was described as *Polynemoidea mexicana* Doutt (1973). It bears the UCMP number 12865, B-5104.

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APPENDIX

List of fossil Mymaridae with amber sources.

ALAPTINAE:

Alaptini

- Alaptus fructuosus* Meunier, 1909. Zanzibar copal, recent.
- A. globosicornis* Girault, 1912. Mexican, late Oligocene, early Miocene.
- A. psocidivorus* Gahan, 1927. Mexican, late Oligocene, early Miocene.
- Litus beneficus* Meunier, 1909. Madagascar copal, recent.
- L. elegans* Meunier, 1901. Baltic, early Oligocene.
- L. mexicanus* Doutt, 1973. Mexican, late Oligocene, early Miocene.

Anagrini

- Malfattia Molitorae* Meunier, 1904. Baltic, early Oligocene; Sicilian, Miocene.
- (This species is doubtfully placed in Anagrini)

MYMARINAE:

Ooctionini

- Arescon baltica* (Meunier), 1901. Baltic, early Oligocene.
- A. armata* (Meunier), 1905. Baltic, early Oligocene.
- Lymaenon henneberti* (Meunier), 1905. Baltic, early Oligocene.
- Ooctionus minutissimus* Brues, 1937. Canadian, Cretaceous.
- Palaeomymar duisburgi* (Stein), 1877. Baltic, early Oligocene.
- Palaeomymar* sp. (undetermined). Mexican, late Oligocene, early Miocene.

Anaphini

- Anaphes schellwieni* Meunier, 1901. Baltic, early Oligocene.
- A. splendens* Meunier, 1901. Baltic, early Oligocene.
- Polynemoidea mexicana* Doutt, 1973. Mexican, late Oligocene, early Miocene.
- Anaphes* sp. (undetermined). Mexican, late Oligocene, early Miocene.

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BOOK REVIEW

AUSTRALIAN BUTTERFLIES. Charles McCubbin. Thomas Nelson (Australia) Ltd., Melbourne. 206 p., fully illustrated in color, xxxi. 1971. \$30.00. North American Distributor: Entomological Reprint Specialists.

This quarto size book is fully and beautifully illustrated with water color paintings by the author of the butterflies (Papilionoidea) and skippers (Hesperioidae) of Australia. Among the most valuable and distinctive aspects are the many color illustrations of immatures, food plants and habitats as well as descriptions of life history and behavior of these Australian Lepidoptera.

The introductory chapter includes valuable information for the amateur on classification, the position of Lepidoptera among insects, the general life history of butterflies and skippers, collecting and curating methods and materials.

This is an extremely important butterfly book with special appeal to all interested in exotic Lepidoptera and their natural history.—ROBBIN W. THORP, *University of California, Davis*, 95616.